What is claimed is:

1. A beam splitting unit for obtaining a plurality of separated light beams from a single light beam, comprising:

a plurality of light-separating portions, each light-separating portion separating incident light into transmitted light and reflected light; and

a maintaining portion maintaining positional relationship among the plurality of light-separating portions into a predetermined positional relationship that allows the plurality of light-separating portions to cooperate to generate a plurality of separated light beams from a single light beam that originally falls incident on one of the plurality of light-separating portions.

2. The beam splitting unit as claimed in claim 1,

wherein the plurality of light-separating portions include a first light-separating portion and a second light-separating portion, the first light-separating portion receiving the single light beam falling incident thereon and separating the single light beam into a transmitted light and a reflected light, the second light-separating portion receiving either one of the transmitted light and the reflected light from the first light-separating portion and separating the received light into another transmitted light and another reflected light,

wherein the maintaining portion includes a main light-transmissive member maintaining the positional relationship between the first light-separating portion and the second light-separating portion into the predetermined positional relationship that allows the either one of the transmitted light and the reflected light from the first light-separating portion to reach the second light-separating portion, thereby allowing the first light-separating portion and the second light-separating portion to obtain three separated light beams from the single light beam.

3. The beam splitting unit as claimed in claim 2,

wherein the main light-transmissive member has a first surface and a second surface which are parallel to each other,

wherein the first light-separating portion includes a first light-separating layer,

wherein the second light-separating portion includes a second light-separating layer,

further comprising:

a first additional light-transmissive member that is provided in contact with the first light-separating layer, the first light-separating layer being located between the main light-transmissive member and the first additional light-transmissive member,

a second additional light-transmissive member that is provided in contact with the second light-separating layer, the second light-separating layer being located between the main light-transmissive member and the second additional light-transmissive member, and

wherein the main light-transmissive member, the first additional light-transmissive member, and the second additional light-transmissive member form a shape of a rectangular parallelepiped as a whole.

4. The beam splitting unit as claimed in claim 3,

wherein the first light-separating layer defines a first light-separating surface and the second light-separating layer defines a second light-separating surface;

wherein the first light-separating surface forms a first predetermined angle with the first surface; and

wherein the second light-separating surface forms a second predetermined angle with the first surface.

5. The beam splitting unit as claimed in claim 4, wherein the first and second light-separating surfaces are parallel to each other, with the first and second predetermined angles having values of 45 ° , thereby obtaining three separated light beams, each two separated light beams among the three separated light beams having either one of parallel and orthogonal relationships with each other.

6. The beam splitting unit as claimed in claim 4, wherein the first predetermined angle has a value of 45°

and the second predetermined angle has a value of 45° $-\alpha$, where α is in a range of $0° < \alpha < 45°$.

7. The beam splitting unit as claimed in claim 3,

wherein the first surface of the main light-transmissive member receives the single light beam falling incident thereto, the main light-transmissive member guiding the single light beam to the first light-separating layer;

wherein the first additional light-transmissive member has an end surface that is parallel to the first surface and the second surface and that transmits the transmitted light beam from the first light separating portion;

wherein the second light-separating portion receives the reflected light from the first light-separating portion and separates the received light into the another transmitted light and another reflected light,

wherein the main light-transmissive member guides the reflected light from the first light-separating portion to the second light-separating portion, and

wherein the second additional light-transmissive member has an end surface that is orthogonal to the first surface and the second surface and that outputs the another transmitted light from the second light-separating layer, the second surface of the main light-transmissive member outputting the another reflected light from the second light-separating layer.

8. The beam splitting unit as claimed in claim 3,

wherein the first additional light-transmissive member has an end surface that is orthogonal to the first surface and the second surface and that receives the single light beam falling incident thereto, the first additional light-transmissive member guiding the single light beam to the first light-separating layer;

wherein the first additional light-transmissive member has another end surface that is parallel to the first surface and the second surface and that outputs the reflected light from the first light-separating layer;

wherein the second light-separating portion receives the transmitted light from the first light-separating portion and separates the received light into the another transmitted light and another reflected light,

wherein the main light-transmissive member guides the transmitted light from the first light-separating portion to the second light-separating portion, and

wherein the second additional light-transmissive member has an end surface that is orthogonal to the first surface and the second surface and that outputs the another transmitted light from the second light-separating layer, the second surface of the main light-transmissive member outputting the another reflected light from the second light-separating layer.

9. The beam splitting unit as claimed in claim 2,

wherein the second light-separating portion receives the transmitted light from the first light-separating portion and separates the received light into the another transmitted light and another reflected light,

wherein the main light-transmissive member guides the transmitted light from the first light-separating portion to the second light-separating portion,

wherein the main light-transmissive member has a first surface and a second surface which are parallel to each other,

wherein the first light-separating portion includes a first light-separating layer,

wherein the second light-separating portion includes a second light-separating layer,

further comprising:

a first additional light-transmissive member that is provided in contact with the first light-separating layer, the first light-separating layer being located between the main light-transmissive member and the first additional light-transmissive member, the first additional light-transmissive member having a first end surface that is orthogonal to the first surface and the second surface and that receives the single light beam falling incident thereto, the first additional light-transmissive member guiding the single light beam to the first light-separating layer;

another main light-transmissive member that is provided in contact with the second light-separating layer, the second light-separating layer being located between the main light-transmissive member and the another main light-transmissive member;

a light-reflecting layer that is provided in contact with the another main light-transmissive member, the light-reflecting layer defining a light-reflecting surface;

a second additional light-transmissive member that is provided in contact with the first additional light-transmissive member;

a third light-separating layer that is provided in contact with the second additional light-transmissive member, the third light-separating layer defining a third light-separating surface;

a third additional light-transmissive member that is provided in contact with the third light-separating layer, the third light-separating layer being located between the second additional light-transmissive member and the third additional light-transmissive member;

a fourth additional light-transmissive member that is provided in contact with the another main light-transmissive member;

a fourth light-separating layer that is provided in contact with the fourth additional light-transmissive member, the fourth light-separating layer defining a fourth light-separating surface; and

a fifth additional light-transmissive member that is provided in contact with the fourth light-separating layer, the fourth light-separating layer being located between the fourth additional light-transmissive member and the fifth additional light-transmissive member.

10. The beam splitting unit as claimed in claim 9,

wherein the second additional light-transmissive member has a second end surface that is parallel to the first end surface and that transmits light reflected from the third light-separating layer;

wherein the third additional light-transmissive member has a third end surface that is orthogonal to the first end surface and that transmits light transmitted through the third light-separating layer;

wherein the fourth additional light-transmissive member has a fourth end surface that is parallel to the first end surface and that transmits light reflected from the fourth light-separating layer;

wherein the fifth additional light-transmissive member has a fifth end surface that is orthogonal to the first end surface and that transmits light transmitted through the fourth light-separating layer;

wherein the first, second, and fourth light-separating surfaces, and the light-reflecting surface are parallel to one another, and form angles of 45° with the first end surface; and

wherein the third light-separating surface is orthogonal to the first, second, and fourth light-separating surfaces.

11. The beam splitting unit as claimed in claim 1, wherein the maintaining portion includes a light-transmissive member unit having three light-transmissive members, the three light-transmissive members are bonded with each other on two bonding surfaces, the two bonding surfaces including first and second bonding surfaces;

wherein the plurality of light-separating portions includes:

a first light-separating layer formed on the first bonding surface within the light-transmissive member unit, the first light-separating layer separating incident light into reflected light and transmitted light, the first light-separating layer defining a first light-separating surface;

a second light-separating layer formed on the second bonding surface within the light-transmissive member unit, the second light-separating layer separating either one of the transmitted light and the reflected light from the first light-separating layer into reflected light and transmitted light, the second light-separating layer defining a second light-separating surface parallel to the first light-separating surface,

thereby obtaining three separated light beams from a single light beam.

12. The beam splitting unit as claimed in claim 1, wherein the maintaining portion includes:

a first light-transmissive member unit having a plurality of light-transmissive members, the plurality of light-transmissive members are bonded with each other on a plurality of bonding surfaces, the plurality of bonding surfaces including first, second, and third bonding surfaces;

a second light-transmissive member unit disposed in contact with the first light-transmissive member unit, the second light-transmissive member unit having two light-transmissive members, the two light-transmissive members are bonded with each other on a fourth bonding surface; and

a third light-transmissive member unit disposed in contact with the first light-transmissive member unit, the third light-transmissive member unit having two light-transmissive members, the two light-transmissive members are bonded with each other on a fifth bonding surface, and

wherein the plurality of light-separating portions includes:

a first light-separating layer formed on the first bonding surface within the first light-transmissive member unit, the first light-separating layer separating incident light into reflected light and transmitted light, the first light-separating layer defining a first light-separating surface;

a second light-separating layer formed on the second bonding surface within the first light-transmissive member unit, the second light-separating layer separating transmitted light from the first light-separating layer into reflected light and transmitted light, the second light-separating layer defining a second light-separating surface parallel to the first light-separating surface;

a light-reflecting layer formed on the third bonding surface within the first light-transmissive member unit, the light-reflecting layer reflecting transmitted light from the second light-separating layer, the light-reflecting layer defining a light-reflecting surface parallel to the first light-separating surface;

a third light-separating layer formed on the fourth bonding surface within the second light-transmissive member unit, the third light-separating layer separating reflected light from the first light-separating layer into transmitted light and reflected light, the third light-separating layer defining a third light-separating surface orthogonal to the first light-separating surface; and

a fourth light-separating layer formed on the fifth bonding surface within the third light-transmissive member unit, the fourth light-separating layer separating reflected light from the light-reflecting layer into transmitted light and reflected light, the fourth light-separating layer defining a fourth light-separating surface parallel to the first light-separating surface,

thereby obtaining five separated light beams from a single light beam.

13. The beam splitting unit as claimed in claim 1, wherein the maintaining portion includes:

a first light-transmissive member unit having a plurality of light-transmissive members, the plurality of light-transmissive members are bonded with each other on a plurality of bonding surfaces, the plurality of bonding surfaces including first and second bonding surfaces;

a second light-transmissive member unit disposed in contact with the first light-transmissive member unit, the second light-transmissive member unit having two light-transmissive members, the two light-transmissive members are bonded with each other on a third bonding surface; and

a third light-transmissive member unit disposed in contact with the first light-transmissive member unit, the third light-transmissive member unit having two light-transmissive members, the two light-transmissive members are bonded with each other on a fourth bonding surface, and

wherein the plurality of light-separating portions includes:

a first light-separating layer formed on the first bonding surface within the first light-transmissive member unit, the first light-separating layer separating incident light into reflected light and transmitted light, the first light-separating layer defining a first light-separating surface;

a light-reflecting layer formed on the second bonding surface within the first light-transmissive member unit, the light-reflecting layer reflecting transmitted light from the first light-separating layer, the light-reflecting layer defining a light-reflecting surface parallel to the first light-separating surface;

a second light-separating layer formed on the third bonding surface within the second light-transmissive member unit, the second light-separating layer separating reflected light from the first light-separating layer into transmitted light and reflected light, the second light-separating layer defining a second light-separating surface orthogonal to the first light-separating surface; and

a third light-separating layer formed on the fourth bonding surface within the third light-transmissive member unit, the third light-separating layer separating reflected light from the light-reflecting layer into transmitted light and reflected light, the third light-separating layer defining a third light-separating surface parallel to the first light-separating surface,

thereby obtaining four separated light beams from a single light beam.

14. The beam splitting unit as claimed in claim 1,

wherein the plurality of light-separating portions include:

a first beam splitter formed with a first light-separating layer; and

a second beam splitter formed with a second light-separating layer, and

wherein the maintaining portion includes:

a holder main body mounted with the first beam splitter; and

a movable holder mounted with the second beam splitter, the movable holder being movably mounted in the holder main body to maintain the positional relationship between the first and second light-separating layers into the predetermined positional relationship that allows the first and second light-separating layers to generate three separated light beams from the single light beam.

15. The beam splitting unit as claimed in claim 14, further comprising a supporting unit supporting the movable holder in a manner rotatable with respect to the holder main body with regard to predetermined three axial directions which are orthogonal to one another, the predetermined three axial directions including a main axial direction and other two axial directions.

16. The beam splitting unit as claimed in claim 15,

wherein the holder main body has a shape of a hollow cylinder having a first axis extending along the main axial direction, the hollow cylinder having an outer surface defining an outer diameter and an inner surface defining an inner diameter, the first beam splitter being located at a position along the first axis of the hollow cylinder;

wherein the movable holder has a shape of a hollow cylinder having a second axis, the hollow cylinder having an outer surface defining an outer diameter smaller than the inner diameter of the holder main body, the second beam splitter being located at a position along the second axis of the hollow cylinder, the movable holder being located relative to the holder main body with the second axis being located on the first axis and extending along the first axis;

wherein the supporting unit supports the hollow cylinder of the movable holder, with at least a part of the hollow cylinder of the movable holder being inserted within the hollow cylinder of the holder main body, the supporting unit including at least four support units which are located at a support position defined along the first axis, each of the at least four support units including:

a spring having a first end and a second end, the spring generating an urging force, the first end contacting and pressing the holder main body by the urging force; and

a spherical body contacting the second end of the spring and being pressed by the second end of the spring, the spherical body also contacting the outer surface of the hollow cylinder of the movable holder and pressing the movable holder by the urging force of the spring.

17. The beam splitting unit as claimed in claim 16,

further comprising an adjusting unit adjusting a rotational position of the movable holder relative to the holder main body with regard to the other two axial directions,

wherein the adjusting unit includes a displacement applying unit which is located at an adjustment position defined along the first axis, the displacement applying unit applying a displacement to a gap between the inner surface of the holder main body and the outer surface of the movable holder at the adjustment position, thereby adjusting the rotational position of the movable holder around the other two axial directions in relation to the holder main body.

18. The beam splitting unit as claimed in claim 17,

wherein the second beam splitter has an emitting surface emitting a transmitted light that has transmitted through the second light-separating layer; and

wherein a distance, along the first axis, between the support position and the adjustment position is greater than or equal to twice a distance, along the first axis, between the emitting surface and the support position.

19. The beam splitting unit as claimed in claim 16,

wherein the first and second beam splitters are cube-shaped;

wherein the first light-separating layer defines a first light-separating surface and the second light-separating layer defines a second light-separating surface; and

wherein the first beam splitter is mounted in the holder main body with the first light-separating surface forming an angle of 45° with respect to the first axis;

wherein the maintaining portion causes the second light-separating surface to become parallel to the first light-separating surface and to form an angle of 45° relative to the first axis, thereby allowing the first and second light-separating layers to produce the three separated light beams, each two separated light beams among the three separated light beams having either one of parallel and orthogonal relationships with each other.

20. The beam splitting unit as claimed in claim 16,

wherein the first and second beam splitters are cube-shaped;

wherein the first light-separating layer defines a first light-separating surface and the second light-separating layer defines a second light-separating surface; and

wherein the first beam splitter is mounted in the holder main body with the first light-separating surface forming an angle of 45° with respect to the first axis; and

wherein the maintaining portion maintains an angle formed by the second light-separating surface and the axis of the hollow cylinder at an angle of $45° - \alpha$, where α is in a range of $0° < \alpha < 45°$.

21. The beam splitting unit as claimed in claim 14,

wherein the plurality of light-separating portions further includes a third beam splitter formed with a third light-separating layer, and wherein the maintaining portion further includes another movable holder mounted with the third beam splitter, the movable holder and the another movable holder being movably mounted in the holder main body to maintain the positional relationships among the first, second, and third light-separating layers into the predetermined positional relationships that allow the first, second, and third light-separating layers to generate four separated light beams from the single light beam.

22. A laser marking apparatus comprising:

a laser generating a light beam;

a beam splitting unit receiving the light beam generated by the laser and generating a plurality of separated light beams, the beam splitting unit including:

a plurality of light-separating portions, each light-separating portion separating incident light into transmitted light and reflected light; and

a maintaining portion maintaining positional relationship among the plurality of light-separating portions into a predetermined positional relationship that allows the plurality of light-separating portions to cooperate to generate a plurality of separated light beams from a single light beam that originally falls incident on one of the plurality of light-separating portions;

a plurality of line-beam-generating optical elements, each line-beam-generating optical element generating a line beam from a corresponding one of the plurality of light beams generated by the beam splitting unit; and

a support unit supporting the laser, the beam splitting unit, and the plurality of line-beam-generating optical elements.

23. The laser marking apparatus as claimed in claim 22,

wherein the plurality of light-separating portions include a first light-separating portion and a second light-separating portion, the first light-separating portion receiving the single light beam falling incident thereon and separating the single light beam into a transmitted light and a reflected light, the second light-separating portion receiving either one of the transmitted light and the reflected light from the first light-separating portion and separating the received light into another transmitted light and another reflected light,

wherein the maintaining portion includes a main light-transmissive member maintaining the positional relationship between the first light-separating portion and the second light-separating portion into the predetermined positional relationship that allows the either one of the transmitted light and the reflected light from the first light-separating portion to reach the second light-separating portion, thereby allowing the first light-separating portion and the second light-separating portion to obtain three separated light beams from the single light beam.

24. The laser marking apparatus as claimed in claim 22,

wherein the maintaining portion includes:

a first light-transmissive member unit having a plurality of light-transmissive members, the plurality of light-transmissive members are bonded with each other on a plurality of bonding surfaces, the plurality of bonding surfaces including first, second, and third bonding surfaces;

a second light-transmissive member unit disposed in contact with the first light-transmissive member unit, the second light-transmissive member unit having two light-transmissive members, the two light-transmissive members are bonded with each other on a fourth bonding surface; and

a third light-transmissive member unit disposed in contact with the first light-transmissive member unit, the third light-transmissive member unit having two light-transmissive members, the two light-transmissive members are bonded with each other on a fifth bonding surface, and

wherein the plurality of light-separating portions includes:

a first light-separating layer formed on the first bonding surface within the first light-transmissive member unit, the first light-separating layer separating incident light into reflected light and transmitted light, the first light-separating layer defining a first light-separating surface;

a second light-separating layer formed on the second bonding surface within the first light-transmissive member unit, the second light-separating layer separating transmitted light from the first light-separating layer into reflected light and transmitted light, the second light-separating layer defining a second light-separating surface parallel to the first light-separating surface;

a light-reflecting layer formed on the third bonding surface within the first light-transmissive member unit, the light-reflecting layer reflecting transmitted light from the second light-separating layer, the light-reflecting layer defining a light-reflecting surface parallel to the first light-separating surface;

a third light-separating layer formed on the fourth bonding surface within the second light-transmissive member unit, the third light-separating layer separating reflected light from the first light-separating layer into transmitted light and reflected light, the third light-separating layer defining a third light-separating surface orthogonal to the first light-separating surface; and

a fourth light-separating layer formed on the fifth bonding surface within the third light-transmissive member unit, the fourth light-separating layer separating reflected light from the light-reflecting layer into transmitted light and reflected light, the fourth light-separating layer defining a fourth light-separating surface parallel to the first light-separating surface,

further comprising a predetermined lens receiving and reflecting a part of the reflected light from the second light-separating layer, the second light-separating layer transmitting the reflected light from the predetermined lens, thereby obtaining six separated light beams from a single light beam.

25. The laser marking apparatus as claimed in claim 22, wherein the plurality of light-separating portions include:

a first beam splitter formed with a first light-separating layer; and

a second beam splitter formed with a second light-separating layer, and

wherein the maintaining portion includes:

a holder main body mounted with the first beam splitter; and a movable holder mounted with the second beam splitter, the movable holder being movably mounted in the holder main body to maintain the positional relationship between the first and second light-separating layers into the predetermined positional relationship that allows the first and second light-separating layers to generate three separated light beams from the single light beam.

26. The laser marking apparatus as claimed in claim 25, further comprising a supporting unit supporting the movable holder in a manner rotatable with respect to the holder main body with regard to predetermined three axial directions which are orthogonal to one another, the predetermined three axial directions including a main axial direction and other two axial directions,

wherein the holder main body has a shape of a hollow cylinder having a first axis extending along the main axial direction, the hollow cylinder having an outer surface defining an outer diameter and an inner surface defining an inner diameter, the first beam splitter being located at a position along the first axis of the hollow cylinder;

wherein the movable holder has a shape of a hollow cylinder having a second axis, the hollow cylinder having an outer surface defining an outer diameter smaller than the inner diameter of the holder main body, the second beam splitter being located at a position along the second axis of the hollow cylinder, the movable holder being located relative to the holder main body with the second axis being located on the first axis and extending along the first axis;

wherein the supporting unit supports the hollow cylinder of the movable holder, with at least a part of the hollow cylinder of the movable holder being inserted within the hollow cylinder of the holder main body, the supporting unit including at least four support units which are located at a support position defined along the first axis, each of the at least four support units including:

a spring having a first end and a second end, the spring generating an urging force, the first end contacting and pressing the holder main body by the urging force; and

a spherical body contacting the second end of the spring and being pressed by the second end of the spring, the spherical body also contacting the outer surface of the hollow cylinder of the movable holder and pressing the movable holder by the urging force of the spring; and

wherein the laser emits the light beam along the first axis, thereby allowing the light beam emitted from the laser and light beams transmitted through the first and second beam splitters to be aligned linearly.

27. A beam-emission-angle compensating optical unit

for correcting a beam emission angle, comprising:

an optical element formed of a light-transmissive member having a refractive index n, including:

a light incident surface receiving an incident light beam in an incident beam direction which is defined with respect to a reference axis; and

a light emitting surface emitting an output light beam in an output beam direction which is defined with respect to the reference axis, the light incident surface and the light emitting surface forming an angle α therebetween and defining an imaginary normal plane, which is orthogonal to both the light incident surface and the light emitting surface and which extends along the reference axis, the output beam direction being shifted by an angle δ from the incident beam direction, the angle δ having a value that depends on the refractive index n, the angle α, and a rotational position of the imaginary normal plane relative to the reference axis.

28. The beam-emission-angle compensating optical unit as claimed in claim 27, wherein the angle α has a value that substantially satisfies an equation $\alpha=\delta/(n-1)$.

29. The beam-emission-angle compensating optical unit as claimed in claim 28,

wherein the reference axis is defined in an xyz space, the xyz space being defined by x-axis, y-axis, and z-axis that are orthogonal to one another, the x-axis and the y-axis defining an xy plane, the x-axis and the z-axis defining an xz plane, and the y-axis and the z-axis defining a yz plane, the reference axis extending along the x-axis, the incident beam direction being shifted from the x-axis by the angle δ, which defines an angle δyz between the y-axis and an orthogonal projection component of the incident light beam in the yz plane; and

wherein the optical element is disposed with its imaginary normal plane being located at a rotational angle ϕ from the xy plane around the x-axis, the rotational angle ϕ being equal to the angle δyz to allow the light emitting surface to output the output light beam in the output beam direction that is parallel with the x axis.

30. The beam-emission-angle compensating optical unit as claimed in claim 27,

wherein the reference axis is defined in an xyz space, the xyz space being defined by x-axis, y-axis, and z-axis that are orthogonal to one another, the x-axis and the y-axis defining an xy plane, the x-axis and the z-axis defining an xz plane, and the y-axis and the z-axis defining a yz plane, the reference axis extending along the x-axis, the incident beam direction being defined by an angle δxy formed between the x-axis and an orthogonal projection component of the incident light beam in the xy plane and another angle δ xz formed between the x-axis and an orthogonal projection component of the incident light beam in the xz plane,

wherein the optical element includes a first optical element and a second optical element, which are arranged along the reference axis, the first optical element receiving the incident light beam and outputting an intermediate light beam, the second optical element receiving the intermediate light beam and outputting an output light beam,

wherein the first optical element is formed of a light-transmissive member having a refractive index n and including:

a first light incident surface receiving the incident light beam in the incident beam direction; and

a first light emitting surface emitting the intermediate light beam in an intermediate beam direction which is defined with respect to the reference axis, the first light incident surface and the first light emitting surface forming an angle α_1 therebetween, the angle α_1 having a value substantially equal to δ xy/(n-1), and defining a first imaginary normal plane, which is orthogonal to both the first light incident surface and the first light emitting surface and which extends along the reference axis,

the first optical element being disposed with the first imaginary normal plane being oriented to extend along the xy plane, thereby outputting the intermediate light beam in the intermediate beam direction that extends parallel to the xz plane;

wherein the second optical element is formed of another light-transmissive member having a refractive index n and including:

a second light incident surface receiving the intermediate light beam in the intermediate beam direction; and

a second light emitting surface emitting the output light beam in the output beam direction which is defined with respect to the reference axis, the second light incident surface and the second light emitting surface forming an angle α_2 therebetween, the angle α_2 having a value substantially equal to $\delta xz/(n-1)$, and defining a second imaginary normal plane, which is orthogonal to both the second light incident surface and the second light emitting surface and which extends along the reference axis,

the second optical element being disposed with the second imaginary normal plane being oriented to extend along the xz plane, thereby outputting the output light beam in the output beam direction that extends parallel to the xy plane, resulting in that the output beam direction extends parallel with the x axis.

31. The beam-emission-angle compensating optical unit as claimed in claim 27, further comprising a holding unit holding the optical element rotatably about the reference axis.

32. The beam-emission-angle compensating optical unit as claimed in claim 31,

wherein the reference axis is defined in an xyz space, the xyz space being defined by x-axis, y-axis, and z-axis that are orthogonal to one another, the x-axis and the y-axis defining an xy plane, the x-axis and the z-axis defining an xz plane, and the y-axis and the z-axis defining a yz plane, the reference axis extending along the z-axis,

the incident beam direction being defined by an angle γ_{1yz} formed between the z-axis and an orthogonal projection component of the incident light beam in the yz plane and by another angle γ_{1xz} formed between the z-axis and an orthogonal projection component of the incident light beam in the xz plane;

wherein the angle α satisfies inequalities:

$$-1 \leqq \gamma_{1yz}/((n-1)\alpha) \leqq 1 \text{ and } -1 \leqq \gamma_{1xz}/((n-1)\alpha) \leqq 1,$$

wherein the holding unit orients the imaginary normal plane of the optical element to form a rotational angle ϕ from the yz plane around the z-axis,

wherein the light emitting surface emits the output light beam with an angle β_{yz} defined between the z-axis and an orthogonal projection component of the output light beam in the yz plane and an angle β_{xz} defined between the z-axis and another orthogonal projection component of the output light beam in the xz plane, the angles β_{yz} and β_{xz} satisfying equations:

$$\beta_{yz} = (n-1)\ \alpha \cdot \cos\phi - \gamma_{1yz} \quad \text{and}$$

$$\beta_{xz} = (n-1)\ \alpha \cdot \sin\phi - \gamma_{1xz}\ .$$

33. The beam-emission-angle compensating optical unit as claimed in claim 32, wherein the output beam direction extends parallel with the xz plane where the rotational angle ϕ satisfies an equation of $\beta_{yz} = 0 = (n-1)\ \alpha \cdot \cos\phi - \gamma_{1yz}$.

34. The beam-emission-angle compensating optical unit as claimed in claim 32, wherein the output beam direction extends parallel with the yz plane where the rotational angle ϕ satisfies an equation of $\beta_{xz} = 0 = (n-1)\ \alpha \cdot \sin\phi - \gamma_{1xz}$.

35. The beam-emission-angle compensating optical unit as claimed in claim 31,

wherein the reference axis is defined in an xyz space, the xyz space being defined by x-axis, y-axis, and z-axis that are orthogonal to one another, the x-axis and the y-axis define an xy plane, the x-axis and the z-axis define an xz plane, and the y-axis and the z-axis define a yz plane, the reference axis extending along the z-axis, the incident beam direction being defined by an angle γ_{1yz} formed between the z-axis and an orthogonal projection component of the incident light beam in the yz plane and by another angle γ_{1xz} formed between the z-axis and an orthogonal projection component of the incident light beam in the xz plane;

wherein the optical element includes a first optical element and a second optical element, which are arranged along the reference axis, the first optical element receiving the incident light beam and outputting an intermediate light beam, the second optical element receiving the intermediate light beam and outputting the output light beam,

wherein the holding unit includes:

a first holding unit holding the first optical element rotatably about the reference axis; and

a second holding unit holding the second optical element rotatably about the reference axis independently from the first optical element,

wherein the first optical element is formed of a light-transmissive member having a refractive index n and including:

a first light incident surface receiving the incident light beam in the incident beam direction; and

a first light emitting surface emitting the intermediate light beam in an intermediate beam direction which is defined with respect to the reference axis, the first light incident surface and the first light emitting surface forming an angle α therebetween and defining a first imaginary normal plane, which is orthogonal to both the first light incident surface and the first light emitting surface and which extends along the reference axis,

wherein the second optical element is formed of another light-transmissive member having a refractive index n and including:

a second light incident surface receiving the intermediate light beam in the intermediate beam direction; and

a second light emitting surface emitting the output light beam in the output beam direction which is defined with respect to the reference axis, the second light incident surface and the second light emitting surface forming the angle α therebetween, and defining a second imaginary normal plane, which is orthogonal to both the second light incident surface and the second light emitting surface and which extends along the reference axis,

wherein the angle α satisfies the inequalities:

$-2 \leqq \gamma_{1yz}/((n-1)\alpha) \leqq 2$ and $-2 \leqq \gamma_{1xz}/((n-1)\alpha) \leqq 2$

wherein the first holding unit orients the first imaginary normal plane to form a rotational angle ϕ_1 from the yz plane around the z-axis,

wherein the second holding unit orients the second imaginary normal plane to form a rotational angle ϕ_2 from the yz plane around the z-axis,

wherein the second light emitting surface of the second optical element emits the output light beam with an angle β_{yz} defined between the z-axis and an orthogonal projection component of the output light beam in the yz plane and an angle β_{xz} defined between the z-axis and another orthogonal projection component of the output light beam in the xz plane, the angles β_{yz} and β_{xz} satisfying equations:

$$\beta_{yz} = (n-1)\ \alpha \cdot (\cos\phi_1 + \cos\phi_2) - \gamma_{1yz} \quad \text{and}$$

$$\beta_{xz} = (n-1)\ \alpha \cdot (\sin\phi_1 + \sin\phi_2) - \gamma_{1xz}\ .$$

36. The beam-emission-angle compensating optical unit as claimed in claim 35, wherein the output beam direction extends parallel with the z-axis where the rotational angles ϕ_1 and ϕ_2 satisfy equations of:

$$\beta_{yz} = 0 = (n-1)\ \alpha \cdot (\cos\phi_1 + \cos\phi_2) - \gamma_{1yz} \quad \text{and}$$

$$\beta_{xz} = 0 = (n-1)\ \alpha \cdot (\sin\phi_1 + \sin\phi_2) - \gamma_{1xz}\ .$$

37. The beam-emission-angle compensating optical unit as claimed in claim 31,

wherein the reference axis is defined in an xyz space, the xyz space being defined by x-axis, y-axis, and z-axis that are orthogonal to one another, the x-axis and the y-axis define an xy plane, the x-axis and the z-axis define an xz plane, and the y-axis and the z-axis define a yz plane, the reference axis extending along the z-axis,

the incident beam direction being defined by an angle γ_{1yz} formed between the z-axis and an orthogonal projection component of the incident light beam in the yz plane and by another angle γ_{1xz} formed between the z-axis and an orthogonal projection component of the incident light beam in the xz plane;

wherein the optical element includes a first optical element and a second optical element, which are arranged along the reference axis, the first optical element receiving the incident light beam and outputting an intermediate light beam, the second optical element receiving the intermediate light beam and outputting the output light beam,

wherein the holding unit includes:

a first holding unit holding the first optical element fixedly about the reference axis; and

a second holding unit holding the second optical element rotatably about the reference axis independently from the first optical element,

wherein the first optical element is formed of a light-transmissive member having a refractive index n and including:

a first light incident surface receiving the incident light beam in the incident beam direction; and

a first light emitting surface emitting the intermediate light beam in an intermediate beam direction which is defined with respect to the reference axis, the first light incident surface and the first light emitting surface forming an angle α therebetween and defining a first imaginary normal plane, which is orthogonal to both the first light incident surface and the first light emitting surface and which extends along the reference axis,

wherein the second optical element is formed of another light-transmissive member having a refractive index n and including:

a second light incident surface receiving the intermediate light beam in the intermediate beam direction; and

a second light emitting surface emitting the output light beam in the output beam direction which is defined with respect to the reference axis, the second light incident surface and the second light emitting surface forming the angle α therebetween, and defining a second imaginary normal plane, which is orthogonal to both the second light incident surface and the second light emitting surface and which extends along the reference axis,

wherein the angle α satisfies the inequalities:

$0 \leqq \gamma_{1yz}/((n-1)\alpha) \leqq 2$ and $-1 \leqq \gamma_{1xz}/((n-1)\alpha) \leqq 1$,

wherein the first holding unit orients the first imaginary normal plane to form a rotational angle ϕ_1 of a zero degree (0°) from the yz plane around the z-axis,

wherein the second holding unit orients the second imaginary normal plane to form a rotational angle ϕ_2 from the yz plane around the z-axis,

wherein the second light emitting surface of the second optical element emits the output light beam with an angle β_{yz} defined between the z-axis and an orthogonal projection component of the output light beam in the yz plane and an angle β_{xz} defined between the z-axis and another orthogonal projection component of the output light beam in the xz plane, the angles β_{yz} and β_{xz} satisfying equations:

$\beta_{yz} = (n-1)\alpha \cdot (1+\cos\phi_2) - \gamma_{1yz}$ and

$\beta_{xz} = (n-1)\alpha \cdot \sin\phi_2 - \gamma_{1xz}$.

38. The beam-emission-angle compensating optical unit as claimed in claim 37, wherein the output beam direction extends parallel with the xz plane where the rotational angle ϕ_2 satisfies an equation of $\beta_{yz} = 0 = (n-1)\alpha \cdot (1+\cos\phi_2) - \gamma_{1yz}$.

39. The beam-emission-angle compensating optical unit as claimed in claim 37, wherein the output beam direction extends parallel with the yz plane where the rotational

angle ϕ_2 satisfies an equation of $\beta_{x2} = 0 = (n-1)\alpha \cdot \sin\phi_2 - \gamma_{1x2}$.

40. A beam-emission-angle compensating optical unit for correcting a beam emission angle, comprising:

an optical element formed of a light-transmissive member having a refractive index n, including:

a light incident surface receiving an incident light beam in an incident beam direction which is defined with respect to a reference axis; and

a light emitting surface emitting an output light beam in an output beam direction which is defined with respect to the reference axis, the light incident surface and the light emitting surface forming an angle α therebetween, the angle α having a value that depends on the refractive index n.

41. The beam-emission-angle compensating optical unit as claimed in claim 40,

wherein the light incident surface and the light emitting surface define an imaginary normal plane, which is orthogonal to both the light incident surface and the light emitting surface and which extends along the reference axis, the incident light direction being shifted from the reference axis with an angle θ, the angle α having a value that substantially satisfies an equation $\alpha = \theta/(n-1)$ and that allows the output beam direction to be parallel with the reference axis.

42. The beam-emission-angle compensating optical unit as claimed in claim 41, wherein the reference axis extends normal to the light incident surface, and wherein the angle α satisfies an inequality $1.1\theta \leqq \alpha \leqq 2.2\theta$.

43. The beam-emission-angle compensating optical unit as claimed in claim 41, wherein the reference axis extends normal to the light incident surface, wherein the refractive index n is within a range $1.45 \leqq n \leqq 1.55$, and the angle α satisfies an equation $\alpha = 2\theta$.

44. A beam-emission-angle compensating optical unit for correcting a beam emission angle, comprising:

a wedge prism formed of a light-transmissive member and including:

a first surface receiving an incident light beam; and

a second surface emitting an output light beam, the first surface and the second surface forming an apex angle α; and

a holding unit holding the wedge prism such that the wedge prism is capable of rotating about a reference axis, the holding unit holding the wedge prism at a rotational angle about the reference axis from a reference rotational position.

45. The beam-emission-angle compensating optical unit

as claimed in claim 44,

wherein the wedge prism includes a first wedge prism and a second wedge prism which are arranged along the reference axis, the first optical element receiving the incident light beam and outputting an intermediate light beam, the second optical element receiving the intermediate light beam and outputting the output light beam; and

wherein the holding unit includes:

a first holding unit holding the first wedge prism; and

a second holding unit holding the second wedge prism.

46. The beam-emission-angle compensating optical unit as claimed in claim 45, wherein the first holding unit holds the first wedge prism such that the first wedge prism can rotate about the reference axis; and wherein the second holding unit holds the second wedge prism such that the second wedge prism can rotate about the reference axis independently from the first wedge prism.

47. The beam-emission-angle compensating optical unit as claimed in claim 45, wherein the first holding unit holds the first wedge prism fixedly at a predetermined rotational position, while the second holding unit holds the second wedge prism such that the second wedge prism can rotate about the reference axis independently from the first wedge

prism.

48. The beam-emission-angle compensating optical unit as claimed in claim 45,

wherein the reference axis is defined in an xyz space, the xyz space being defined by x-axis, y-axis, and z-axis that are orthogonal to each other;

wherein the reference rotational position is defined by the yz plane and the reference axis is the z-axis such that the first and second wedge prisms are disposed at the rotational angles ϕ_1 and ϕ_2 around the z-axis respectively from the yz plane; and

wherein the apex angle α satisfies the inequalities:

$$-2 \leqq \gamma_{1yz} / ((n-1)\alpha) \leqq 2 \quad \text{and} \quad -2 \leqq \gamma_{1xz} / ((n-1)\alpha) \leqq 2,$$

wherein an angle γ_{1yz} is formed between the z-axis and an orthogonal projection component of the incident light beam in the yz plane, and an angle γ_{1xz} is formed between the z-axis and another orthogonal projection component of the incident light beam in the xz plane, and

wherein the rotational angles ϕ_1 and ϕ_2 satisfy equations:

$$\beta_{yz} = (n-1)\,\alpha \cdot (\cos\phi_1 + \cos\phi_2) - \gamma_{1yz} \quad \text{and}$$

$$\beta_{xz} = (n-1)\,\alpha \cdot (\sin\phi_1 + \sin\phi_2) - \gamma_{1xz},$$

wherein an angle β_{yz} is formed between the z-axis and an orthogonal projection component of the output light beam in the yz plane, and an angle β_{xz} is formed between the z-axis and another orthogonal projection component of the output light beam in the xz plane.

49. A laser marking apparatus comprising:

a laser generating a light beam;

a collimating optical element collimating the light beam into a collimated light beam;

a beam-emission-angle compensating optical unit receiving the collimated light beam, as an incident light beam, and correcting a beam emission angle by outputting an output light beam, the beam-emission-angle compensating optical unit having:

an optical element formed of a light-transmissive member having a refractive index n, including:

a light incident surface receiving the incident light beam in an incident beam direction which is defined with respect to a reference axis; and

a light emitting surface emitting the output light beam in an output beam direction which is defined with respect to the reference axis, the light incident surface and the light emitting surface forming an angle α therebetween and defining an imaginary normal plane, which is orthogonal to both the light incident surface and the light emitting surface and which extends along the reference axis, the output beam direction being shifted by an angle δ from the incident beam direction, the angle δ

having a value that depends on the refractive index n, the angle α, and a rotational position of the imaginary normal plane relative to the reference axis;

a line-beam-generating optical element generating a line beam from the output light beam from the beam-emission-angle compensating optical unit; and

a support unit supporting the laser, the collimating optical element, the beam-emission-angle compensating optical unit, and the line-beam-generating optical element.

50. The laser marking apparatus as claimed in claim 49, further comprising a holding unit holding the optical element such that the optical element can rotate about the reference axis.

51. The laser marking apparatus as claimed in claim 49, further comprising a beam splitting unit receiving the collimated light beam from the collimating optical element and splitting the light beam into a plurality of incident light beams;

wherein the beam-emission-angle compensating optical unit includes a plurality of beam-emission-angle compensating optical units each receiving a corresponding one of the plurality of incident light beams and correcting its beam emission angle,

wherein the line-beam-generating optical element includes a plurality of line-beam-generating optical elements, each generating a line beam from an output light beam that is emitted from a corresponding beam-emission-angle compensating optical unit; and

wherein the support unit supports the laser, the collimating optical element, the beam splitting unit, the beam-emission-angle compensating optical units, and the line-beam-generating optical elements.

52. The laser marking apparatus as claimed in claim 51, wherein the beam splitting unit includes:

a plurality of light-separating portions, each light-separating portion separating incident light into transmitted light and reflected light; and

a maintaining portion maintaining positional relationship among the plurality of light-separating portions into a predetermined positional relationship that allows the plurality of light-separating portions to cooperate to generate a plurality of separated light beams from a single light beam that originally falls incident on one of the plurality of light-separating portions.

53. A beam splitter for obtaining a plurality of separated light beams from a single light beam, comprising:

a light-transmissive member unit having three light-transmissive members, the three light-transmissive members are bonded with each other on two bonding surfaces, the two bonding surfaces including first and second bonding surfaces;

a first light-separating layer formed on the first bonding surface within the light-transmissive member unit, the first light-separating layer separating incident light into reflected light and transmitted light, the first light-separating layer defining a first light-separating surface;

a second light-separating layer formed on the second bonding surface within the light-transmissive member unit, the second light-separating layer separating either one of the transmitted light and the reflected light from the first light-separating layer into reflected light and transmitted light, the second light-separating layer defining a second light-separating surface parallel to the first light-separating surface, thereby obtaining three separated light beams from a single light beam.

54. A beam splitter for obtaining a plurality of separated light beams from a single light beam, comprising:

a first light-transmissive member unit having a plurality of light-transmissive members, the plurality of light-transmissive members are bonded with each other on a plurality of bonding surfaces, the plurality of bonding surfaces including first, second, and third bonding surfaces;

a second light-transmissive member unit disposed in contact with the first light-transmissive member unit, the second light-transmissive member unit having two light-transmissive members, the two light-transmissive members are bonded with each other on a fourth bonding surface;

a third light-transmissive member unit disposed in contact with the first light-transmissive member unit, the third light-transmissive member unit having two light-transmissive members, the two light-transmissive members are bonded with each other on a fifth bonding surface;

a first light-separating layer formed on the first bonding surface within the first light-transmissive member unit, the first light-separating layer separating incident light into reflected light and transmitted light, the first light-separating layer defining a first light-separating surface;

a second light-separating layer formed on the second bonding surface within the first light-transmissive member unit, the second light-separating layer separating transmitted light from the first light-separating layer into reflected light and transmitted light, the second light-separating layer defining a second light-separating surface parallel to the first light-separating surface;

a light-reflecting layer formed on the third bonding surface within the first light-transmissive member unit, the light-reflecting layer reflecting transmitted light from the second light-separating layer, the light-reflecting layer defining a light-reflecting surface parallel to the first light-separating surface;

a third light-separating layer formed on the fourth bonding surface within the second light-transmissive member unit, the third light-separating layer separating reflected light from the first light-separating layer into transmitted light and reflected light, the third light-separating layer defining a third light-separating surface orthogonal to the first light-separating surface; and

a fourth light-separating layer formed on the fifth bonding surface within the third light-transmissive member unit, the fourth light-separating layer separating reflected light from the light-reflecting layer into transmitted light and reflected light, the fourth light-separating layer defining a fourth light-separating surface parallel to the first light-separating surface,

thereby obtaining five separated light beams from a single light beam.

55. A beam splitter for obtaining a plurality of separated light beams from a single light beam, comprising:

a first light-transmissive member unit having a plurality of light-transmissive members, the plurality of light-transmissive members are bonded with each other on a plurality of bonding surfaces, the plurality of bonding surfaces including first and second bonding surfaces;

a second light-transmissive member unit disposed in contact with the first light-transmissive member unit, the second light-transmissive member unit having two light-transmissive members, the two light-transmissive members are bonded with each other on a third bonding surface;

a third light-transmissive member unit disposed in contact with the first light-transmissive member unit, the third light-transmissive member unit having two light-transmissive members, the two light-transmissive members are bonded with each other on a fourth bonding surface;

a first light-separating layer formed on the first bonding surface within the first light-transmissive member unit, the first light-separating layer separating incident light into reflected light and transmitted light, the first light-separating layer defining a first light-separating surface;

a light-reflecting layer formed on the second bonding surface within the first light-transmissive member unit, the light-reflecting layer reflecting transmitted light from the first light-separating layer, the light-reflecting layer defining a light-reflecting surface parallel to the first light-separating surface;

a second light-separating layer formed on the third bonding surface within the second light-transmissive member unit, the second light-separating layer separating reflected light from the first light-separating layer into transmitted light and reflected light, the second light-separating layer defining a second light-separating surface orthogonal to the first light-separating surface; and

a third light-separating layer formed on the fourth bonding surface within the third light-transmissive member unit, the third light-separating layer separating reflected light from the light-reflecting layer into transmitted light and reflected light, the third light-separating layer defining a third light-separating surface parallel to the first light-separating surface, thereby obtaining four separated light beams from a single light beam.

56. A beam splitting unit for obtaining a plurality of separated light beams from a single light beam, comprising:

a first beam splitter formed with a first light-separating layer;

a second beam splitter formed with a second light-separating layer;

a holder main body mounted with the first beam splitter; and

a movable holder mounted with the second beam splitter, the movable holder being movably mounted in the holder main body to maintain a positional relationship between the first and second light-separating layers into a predetermined positional relationship that allows the first and second light-separating layers to generate three separated light beams from the single light beam.